RN4CAST Australia: Effect of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions and length of stay

Linda Aiken, Matthew McHugh, Douglas Stone, Clint Douglas, Carol Windsor, Patsy Yates

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ACKNOWLEDGEMENT OF TRADITIONAL OWNERS

QUT acknowledges the Turrbal and Yugara, as the First Nations owners of the lands where QUT now stands. We pay respect to their Elders, lores, customs and creation spirits. We recognise that these lands have always been places of teaching, research and learning.

QUT acknowledges the important role Aboriginal and Torres Strait Islander people play within the QUT community.

Acknowledgements

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Disclaimer

- The researchers are solely responsible for the following findings and their interpretation and do not necessarily represent the views or conclusions of Queensland Health.

Background

- On 1 July 2016, Queensland Health implemented legislation establishing nurse-to-patient ratios in 27 prescribed public facilities across the state.
- Legislated standard ratios specify an average of 1:4 on morning/afternoon shifts and 1:7 on night shifts in prescribed acute adult medical-surgical wards.
- Ratios complement the existing Business Planning Framework as the current workload planning tool.
- Ratios are intended to determine minimum staffing allocation.

Study Design RN4CAST-Australia

- Approach based on methods that have been well-tested in prior studies of thousands of facilities around the world including RN4CAST-EU and RN4CAST-US.
- Prospective panel study
- All Queensland public facilities with ≥ 50 and over half with < 50 beds. The average facility was represented by 64 respondents.
- Compared 27 QLD ratio hospitals with 28 comparison hospitals at two time points
  - Baseline prior to implementation
  - Post implementation two years after implementation.
- Sample included adult patients in general medical-surgical wards. Patients undergoing labour and delivery and patients being treated for psychiatric conditions were excluded.

McHugh, M.D., Aiken, L.H., Sloane, D.M., Windsor, C., Douglas, C. & Yates, P. (2021) Effects of nurse-to-patient ratio legislation on nurse staffing and patient mortality, readmissions, and length of stay: a prospective study in a panel of hospitals. The Lancet, 397(10288), 1905-1913.

Study Design RN4CAST Australia

- Standardised Queensland Hospital Admitted Patient Data Collection:
  - o baseline period (July 1, 2015, to June 1, 2016)
  - o two years after implementation of ratios (Jan 1 to Dec 31, 2018).
- Data included patient demographics, diagnoses, procedures (with coding from the International Classification of Diseases, tenth edition, Australia modification), comorbidities, and discharge status.
- Files were linked with death records to measure 30-day mortality.
- Baseline = 231,902 patients; Post implementation = 257,253 patients

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Study Design RN4CAST Australia

- Nurse surveys at multiple time points before and after implementation to provide data on staffing and other features of the nurse work environment.
- Respondents identified hospital and the type of ward to attribute information from medical-surgical ward respondents to their hospital, aggregate their responses to produce hospital-level measures of medical-surgical ward staffing, and link them to independent data on patient outcomes and hospital size.
- Baseline survey data were collected between May 1 and May 31, 2016 (before ratio implementation on July 1, 2016).
    - 26,871 survey and received responses from 8732 (32%).
- Post implementation survey 2 years after implementation between May 1 and May 31, 2018.
    - 30,658 survey and received responses from 8278 nurses, (27%).

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Data analysis

- Adjusted for differences in patient mix across hospitals
- Readmission and mortality models included risk scores for each outcome derived from models that regressed the different outcomes on 17 indicators (eg, diabetes, cancer, and so on) from the Charlson Comorbidity Index

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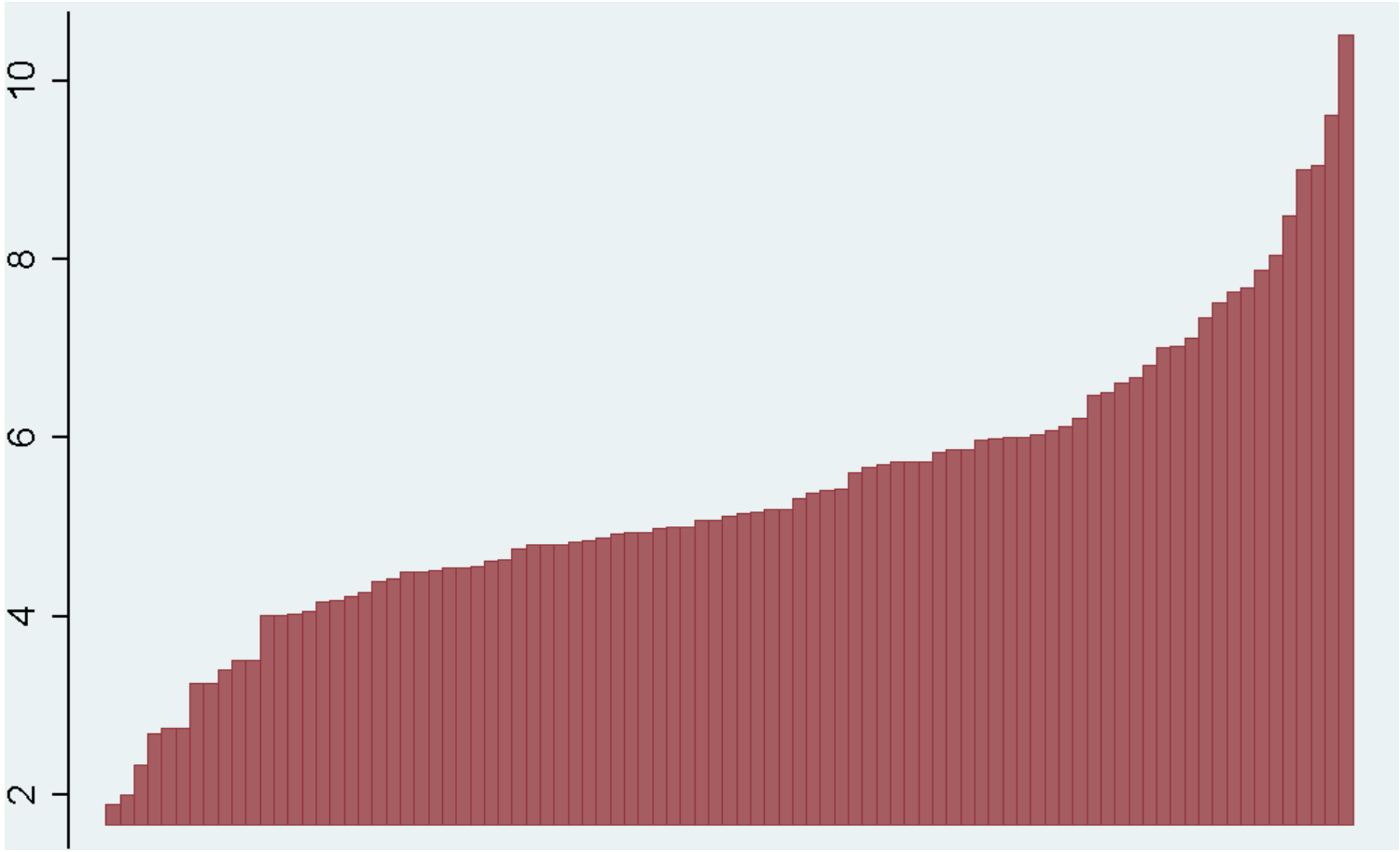
What were conditions before implementation of ratios?

How much variation was there before legislation?

Day/evening adult acute medical-surgical patients per nurse by facility



Data Source: RN4CAST-Australia survey data

What did Queensland acute adult medical-surgical nurses say about staffing levels before ratios?

- Half reported that there was not enough staff to get the work done.
- Nearly one in three reported that there was not enough staff to be able to detect early signs of patient deterioration.
- Half reported that there was not enough staff to provide high quality care.

Data Source: RN4CAST Australia survey data

What were the consequences of staffing variation for nurses?

- After accounting for individual nurse characteristics and hospital size, each additional patient per nurse was associated with:
  - 30% higher odds of a nurse not recommending the hospital to family or friends (OR=1.30; 95% CI 1.14 to 1.49)
  - 32% higher odds of rating patient safety at their hospital as less than excellent (OR=1.32; 95% CI 1.11 to 1.57)
  - 12% higher odds of rating quality as less than excellent (OR=1.12; 95% CI 1.01 to 1.25)
  - 15% higher odds of emotional exhaustion (OR=1.15; 95% CI 1.07 to 1.23)
  - 14% higher odds of job dissatisfaction (OR=1.14; 95% CI 1.02 to 1.28).

McHugh, M.D., Aiken, L.H., Windsor, C., Douglas, C. & Yates, P. (2020) Case for hospital nurse-to-patient ratio legislation in Queensland, Australia, hospitals: an observational study. BMJ Open, 10(9), e036264.

What were the consequences for patients?

- Each additional patient per medical-surgical nurse was associated with:
  - **12% higher likelihood of death in the facility**
  - **2% longer length of stay**

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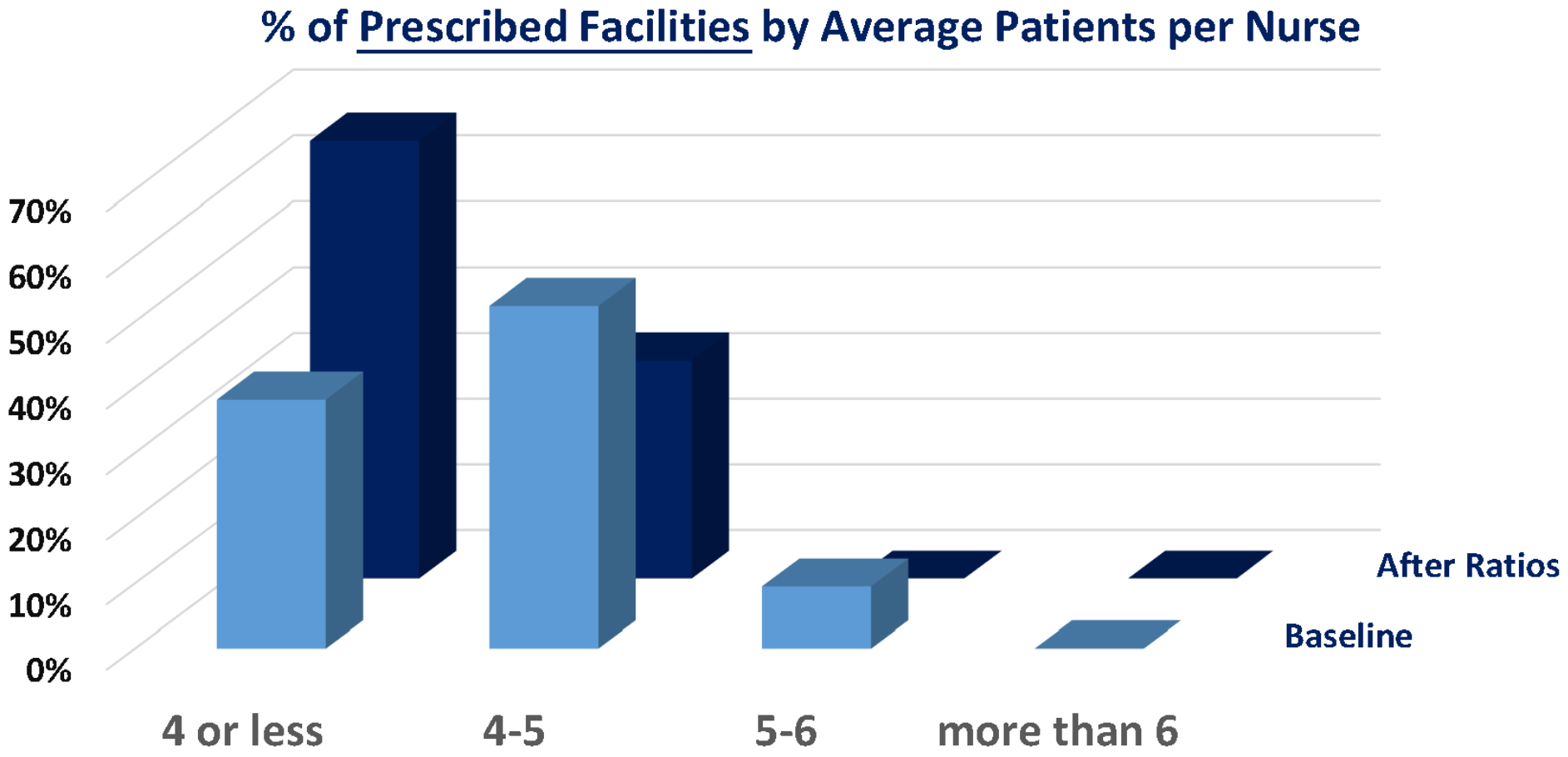
Was Queensland Health justified in implementing nurse-to-patient ratios?

Yes

- Staffing levels varied significantly across Queensland facilities; and
- Variation in staffing had consequences for nurses and their patients.

What happened *after* implementation of ratios?

Did ratios legislation lead to improvements in nurse staffing levels?



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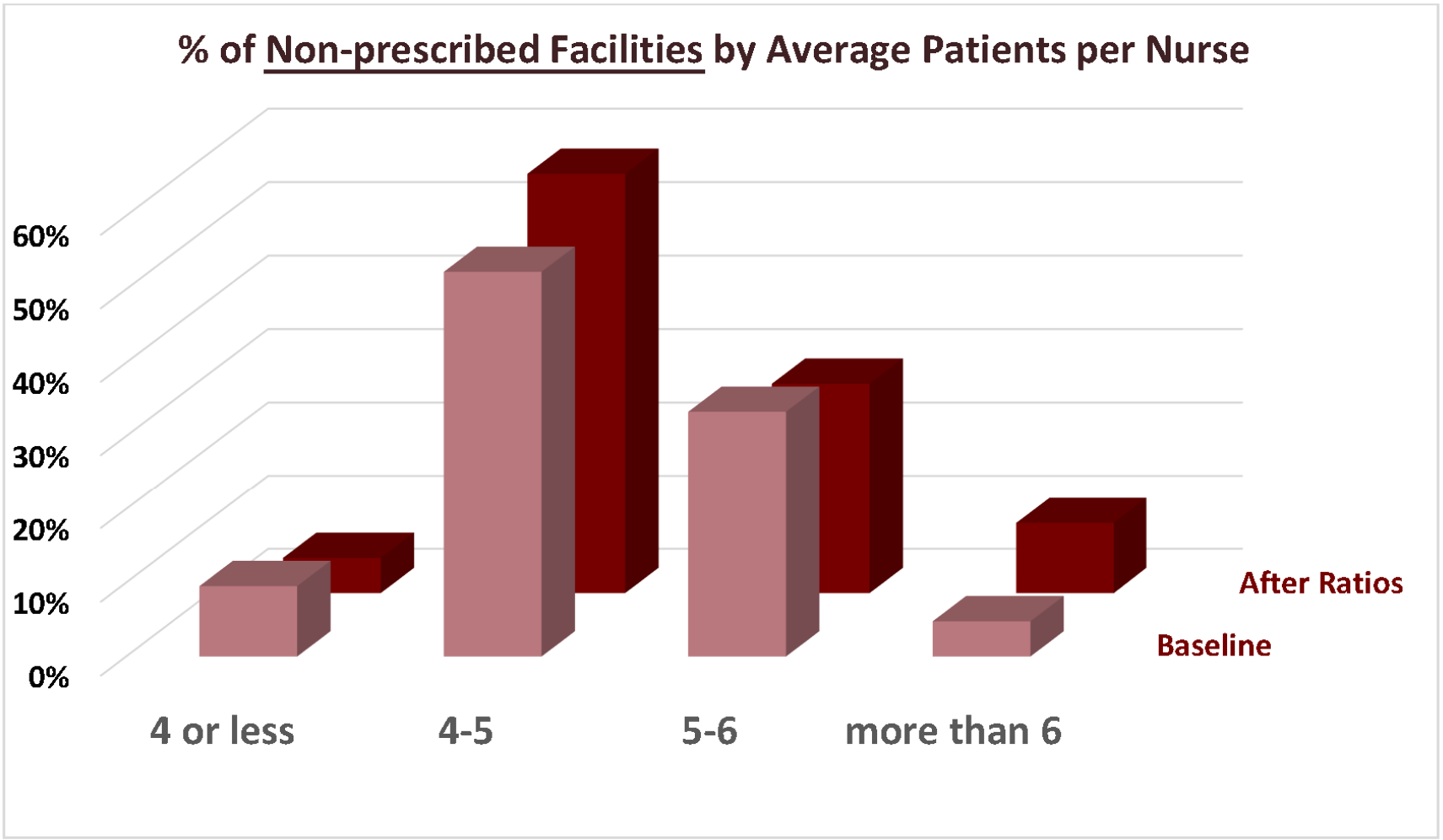

CRICOS No.

Data Source: RN4CAST Australia survey data

Key Patient Outcomes

- After implementation, mortality rates were:
  - o not significantly higher than at baseline in comparison hospitals
    - ❑ *adjusted odds ratio 1·07, 95% CI 0·97–1·17, p=0·18*
  - o significantly lower than at baseline in intervention hospitals
    - ❑ *adjusted odds ratio ·89, 0·84–0·95, p=0·0003*
- From baseline to post-implementation, readmissions:
  - o increased in comparison hospitals: *adjusted odds ratio 1·06, 1·01–1·12, p=0·015*
  - o did not increase in intervention hospitals: *adjusted odds ratio 1·00, 0·95–1·04, p=0·92*
- LOS decreased in both groups post-implementation, but the reduction was more pronounced in intervention hospitals than in comparison hospitals
  - o adjusted incident rate ratio [IRR] 0·95, 95% CI 0·92–0·99, p=0·010

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Key Patient Outcomes

- Staffing improvements by one patient per nurse produced reductions in:
  - mortality (OR 0·93, 95% CI 0·86–0·99, p=0·045)
  - readmissions (0·93, 0·89–0·97, p<0·0001)
  - LOS (IRR 0·97, 0·94–0·99, p=0·035)
- Costs avoided due to fewer readmissions and shorter LOS were more than twice the cost of the additional nurse staffing
  - Intervention hospitals estimated to have avoided 145 more deaths, 255 readmissions, and 29,222 additional hospital days

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Did those improvements lead to better patient safety and quality?

Yes

Even after taking into account:

- cross-sectional differences between facilities,
- differences among nurses within facilities, and
- a number of measurable potential confounding variables

Changes over time within facilities in staffing were associated with significant change in quality of care, patient safety, and nurse job outcomes.

Were the improvements among prescribed facilities attributable to the improvements in staffing following ratios implementation?

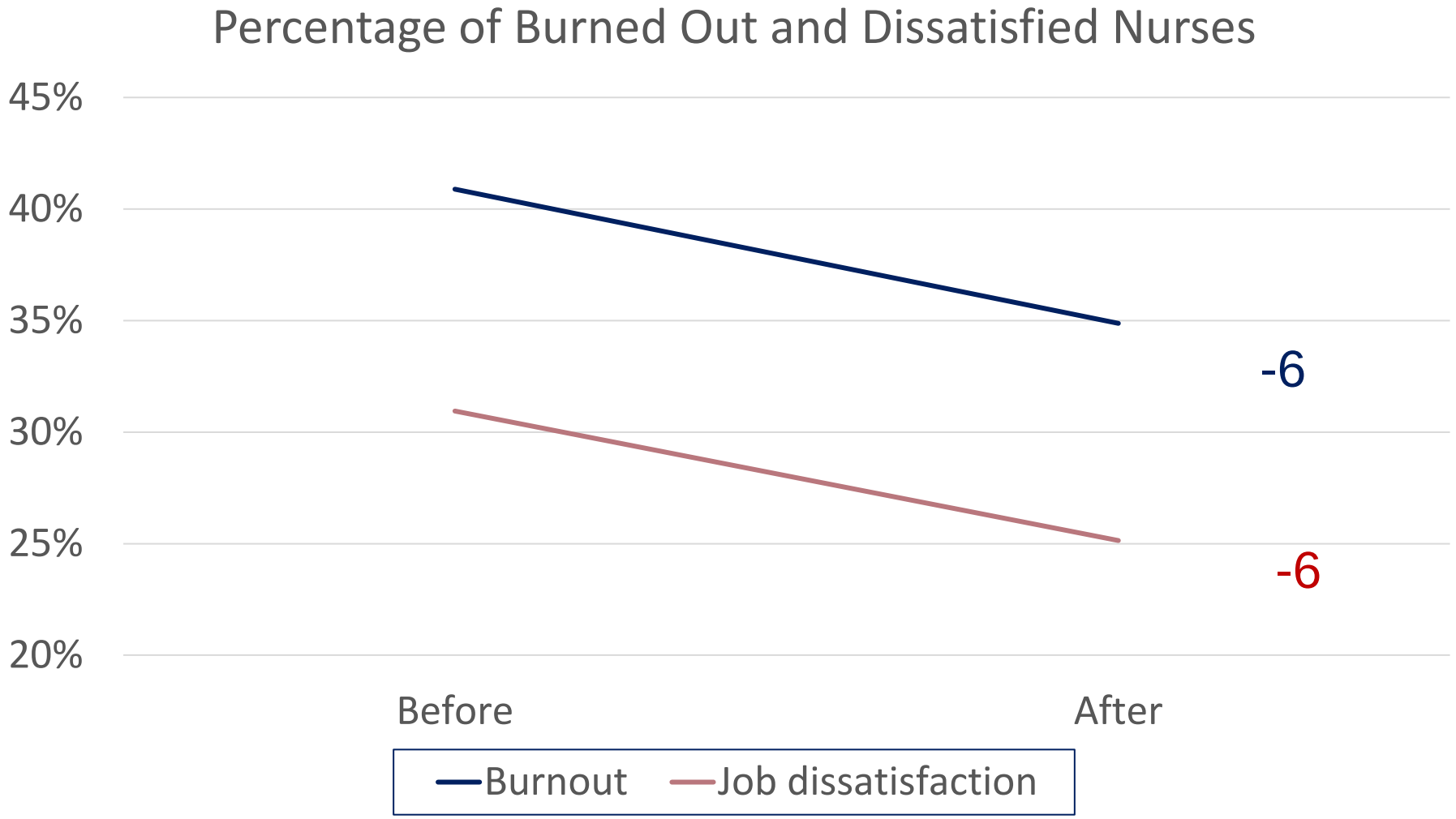
Yes

- Reductions of 1 patient per adult acute adult med-surg nurse were associated with significantly lower odds of:

Rating quality of care less than excellent	**↓21%**
Giving a failing grade on hospital safety	**↓35%**
Giving a failing grade on infection prevention	**↓12%**
Rating the hospital less than 9 or 10/10	**↓8%**
Not recommending hospital to family/friends	**↓12%**
Inadequate time to complete necessary care	**↓16%**
Inadequate time to detect patient changes	**↓13%**
Job dissatisfaction	**↓8%**
Burnout	**↓7%**

Data Source: RN4CAST Australia survey data

Did ratios affect nurse burnout & job dissatisfaction?



Data Source: RN4CAST Australia survey data

Discussion

- Consistent with US and Europe where each additional patient per nurse was associated with similarly higher likelihood of death.
- Contributes to understanding of the causal relationship between improved staffing and patient outcomes

- Limitations:
  - Quasi-experimental design
  - Some hospitals did not have enough nurse respondents to reliably estimate staffing